show the increased scintillation most. The author's general conclusion is that the effect is not one due to direct influence of the electro-magnetic light of aurora on the scintillation itself, but to disturbances (probably a cooling) which coincide with the appearance of aurora in the upper regions of the air, traversed by the star-rays.

An acoustical apparatus for lecture purposes, devised by Dr. Maschke (*Wied. Ann.* No. 5), consists of a longish graduated piece of wood on adjustable supports, and having a longitudinal groove in in its upper surface, in which a glass tube is placed. At the end of the wooden piece is a screw arrangement supporting a thin steel rod which enters the tube, and has at its end a (vertical) ring with collodion membrane, against which hangs a little ball of shellac by a cocoon-fibre from the upper border. The tube may be made a closed one by means of a felt-covered piston. When the tube is sounded by means of a suitable tuning-fork, the shellac ball shows pendulum-motions, if not at a nodal point. The effects may be projected on a screen.

The passivity of iron has been studied under new conditions by M. Bibart (*Jour. de Phys.*, May), and he considers it is not produced by a layer of insoluble sub-nitrate, as some physicists have thought, since the previous action of nitric acid is not necessary. Still less is it due to a formation of bioxide of nitrogen. It is produced by any cause which tends to oxidise iron, and destroyed by any cause which tends to deoxidise it. It is due then either to a layer of oxide or a layer of oxygen. The oxides formed on the surface may preserve it by their very presence, furnishing a sort of unattackable varnish, or they may preserve it like platinum, liberating, on the denuded parts, a protective layer of oxygen. The passivity of iron from contact of platinum seems to be produced at first by a simple layer of oxygen condensed on the platinum surface (a simple shock destroys it). But by degrees a layer of oxide is formed, and the iron then loses its passivity much less readily than before.

GEOGRAPHICAL NOTES

Dr. Schweinfurth, who left Suez for Socotra on February 23, returned on June 19. From the *Egyptian Gazette* we learn that his voyage to the island in a native vessel lasted one month (with calls). He was a month on the island. The rich flora yielded many new species. The mountains are well wooded, and covered with a more luxuriant vegetation than Mount Etna. The climate is exceptionally temperate, and the natives are inoffensive, greater security being experienced everywhere than in any part of uncivilised Africa On the approach of the south-west monsoon Dr. Schweinfurth had to leave, and in a miserable native vessel he tried to reach the Arabian coast opposite Socotra. It was found impossible to get to the east of Aden, and in H.M.S. *Dragon*, which was met, the explorer was conveyed to that place. Dr. Schweinfurth has brought with him a rich botanical collection, including some living plants which he will try to acclimatise in his garden at Cairo.

The Polar relief ship *Rodgers*, Lieut. Berry, sailed from San Francisco on June 16 in search of the *Jeannette.* She will first cruise to St. Berry, then proceed to Petropaulovsky, then cross to St. Michael's in Alaska to coal, thence to St. Lawrence Bay and along the coast of Northern Siberia, making inquiries of the natives; then from Cape Serge to Kamon, where letters will be left with some natives; then north to Herald Island, hunting well over for cairns. It is intended next to go along the southern shore of Wrangel Land, and seek a harbour to winter in. The north-east and west coasts will be examined in sledge parties. Lieut. Berry means to return, if possible, by the second year.

Instructions have now been issued by Brigadier-General Hazen, of the U.S. Signal Office, to the commanding officers of the two expeditionary forces about to be sent out to establish permanent stations of observation in Polar regions. Lieut. Greely commands one of these forces, which goes to the neighbourhood of the coal-seam discovered near Lady Franklin Bay in 1875. The steamer will directly return (with a transcript of observations during the voyage), and the party landed will proceed to erect dwelling-houses and observatories, after which a sledge party will proceed to the high land near Cape Joseph Henry. It is intended that the permanent station shall be visited in 1882 and 1883 by a steam-sealer or other vessel with stores, &c., but directions in case of failure are supplied. Lieut. Ray commands the other expedition, which will sail from San Francisco for Point Barrow, Alaska Territory, and establish there a permanent station to be occupied till the summer of 1884 and visited annually. A great variety of observations will be made by both parties, and the instructions drawn out by the recent Hamburg Conference (with added notes from the U.S. Chief Signal Office) are furnished.

Dr. Gerard Rohlfs delivered an interesting lecture at the meeting of the Berlin Gesellschaft für Erdkunde regarding his last journey in Abyssinia. He was received in a friendly manner by the inhabitants, and he is quite charmed with the hospitality of the Abyssinians. At Debratabor he was received kindly by Negus (Emperor) Johannes, and this was of great importance for his subsequent tour. Rohlfs travelled in a northerly direction to the ancient Portuguese capital Gondar, the residence of the late King Theodore. By means of a pass given to him by the ecclesiastical chief of the city he was able to inspect all the ancient historical buildings of the city. He continued his journey to the north, and after crossing the Takkaze River he reached Artum (Axum ?), the ancient former royal residence, with its monuments dating from the period of Ptolemy. In April Rohlfs reached the Nassaur mountain chain, the boundary of Abyssinia, whence he proceeded to Cairo by boat.

The expedition sent out by the French Secretary for Public Instruction to investigate the east coast of Finmarken has arrived at Vadsö after a journey of twenty-one days. The expedition, which is under the command of M. Georges Pouchet, has for its special object to study the natural history of the Varanger Fjord, which is situated at the boundary of the Atlantic and Arctic Oceans. The keeper of the Christiania Royal Zoological Collections joined the expedition at Hammerfest.

The Emperor of Germany has honoured Dr. Oscar Lenz, the well-known African traveller, with the Order of the Crown.

Mr. Sandford Fleming, C.M.G., Engineer-in-Chief of the Canadian Pacific Railroad, is to attend the International Geographical Congress at Venice in the interests of the question of standard time, coupled with which is that of a prime meridian. The former of these subjects is attracting much attention on the other side of the Atlantic, and a paper on it was lately read by Mr. Fleming before the American Society of Civil Engineers at a convention in Montreal, which brought out an interesting discussion, and a committee, consisting of leading railway officials in Canada and the United States, was appointed to examine and report at a future meeting. Dr. Barnard, the President of Columbia College, New York, is to represent the American Meteorological Society on the same subject at a meeting of the Association for the Reform and Codification of the Law of Nations, which is to be held at Cologne in August.

Col. Perrier, a well-known French topographer, has lately been for some time engaged in survey work in the Regency of Tunis, and has prepared a map of the Kroumir country, which will shortly be published by the Dépôt de la Guerre.

Messrs. S. Clarke and J. H. Riley, of the China Inland Mission, whose station is at Chungking, formerly Mr. Colborne Baber's head-quarters, have each lately made important journeys in the Szechuen province. Mr. French, accompanied in one of his journeys by Mr. Broumton, has visited nearly every city in Eastern Yünnan, and has lately started again for the same region. In the course of their journey from Burmah Messrs. Soltan and Stevenson also made extensive journeys in the western part of the Yünnan province.

The steamer *Nordenskjöld* is to start this week for the Gulf of Obi to the assistance of the *Oscar Dickson* and the *Nordland.* The crews of these vessels were all safe on April 23, when five men from the former left for Tobolsk, which they have lately reached.

A letter from Mussuca, on the Lower Congo, states that a Jesuit missionary expedition has been set on foot to penetrate into the far interior. Père Argourd has been sent from the French mission station at Landana to organise a party of about thirty to proceed to Stanley Pool. He tried to procure carriers at Boma, Mussuca, and Noki, but not succeeding there, he went some thirteen miles inland to King Kangan Pecca, with a view to secure his aid. This was readily obtained by a truly missionary present of two gallons of rum, and Père Argourd returned with eight men and the promise that seventeen more should be sent shortly. The men however ran away the next day, and, yielding to circumstances, Père Argourd has resolved to proceed to Stanley Pool by M. de Brazza's route up the Ogowe.

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MR. CRUDGINGTON, of the Baptist Congo Expedition, has just returned to England for a short time, and reports that by now Messrs. Comber and Bentley will have formed a first station at Isangila, Mr. Stanley's second post, and will at once push on to Mbu, some sixty or seventy miles further along the north bank of the Congo, where the the second station will be erected. It is for this navigable portion of the river that a steel boat is required, so as to avoid the Basundi. In his late journey up the Congo Mr. Crudgington found these people warlike and troublesome, as Mr. Stanley had done, and they were a source of perpetual anxiety to him. The practicability of utilising this part of the river is shown by the fact that Mr. Crudgington and his party went over it in heavy, clumsy, native canoes; but from Mbu the expedition will have to go to Stanley Pool by land, as the rapids and falls render the river quite unnavigable. The plans of the expedition are now on such an extended scale that six additional missionaries will be required—two for San Salvador, one for the depot at Mussuca on the Lower Congo, one each for Isangila and Mbu, and four for Stanley Pool, so that occasional journeys may be made higher up the Congo. The steel boat required by the expedition has been presented by an anonymous donor at a cost of about 400*l.* It has been built in London from drawings furnished by Mr. H. M. Stanley.

THE *Times* last week published an exceedingly interesting letter on trade and exploration on the Congo from a private correspondent at the mouth of the Ogowé. Speaking of M. Savorgnan de Brazza, the writer says that he has done much to open up the country between the Ogowé and the Congo, that he purchased a large tract of country near the sources of the former river at a very cheap rate, erected a station, and left a white man in charge. He is said to have purchased villages as they stood, freed a great many slaves, and engaged them at monthly wages to cultivate the plantations and keep the ground in order. He seems to have been regarded as the apostle of freedom in the country; troops of slaves came flocking to him to be freed, and his visit is regarded as having struck a blow at slavery in West Africa. The writer gives a very different picture of the state of affairs on the Belgian road along the north bank of the Congo. It may be interesting to mention, the observations respecting the light in which M. de Brazza is viewed by the natives are fully confirmed by a letter from a Roman Catholic missionary who accompanied him up the Ogowé last December.

WHIRLED ANEMOMETERS

IN the course of the year 1872 Mr. R. H. Scott, F.R.S., suggested to the Meteorological Committee the desirability of carrying out a series of experiments on anemometers of different patterns. This suggestion was approved by the Committee, and in the course of the same year a grant was obtained by Mr. Scott from the Government grant administered by the Royal Society for the purpose of defraying the expenses of the investigation. The experiments were not however carried out by Mr. Scott himself, but were intrusted to Mr. Samuel Jeffery, then Superintendent of the Kew Observatory, and Mr. G. M. Whipple, then First Assistant, the present Superintendent.

The results have never hitherto been published, and I was not aware of their nature till on making a suggestion that an anemometer of the Kew Standard pattern should be whirled in the open air, with a view of trying that mode of determining its proper factor, Mr. Scott informed me of what had already been done, and wrote to Mr. Whipple, requesting him to place in my hands the results of the most complete of the experiments, namely, those carried on at the Crystal Palace, which I accordingly obtained from him. The progress of the inquiry may be gathered from the following extract from Mr. Scott's report in returning the unexpended balance of the grant:—

"The comparisons of the instruments tested were first instituted in the garden of the Kew Observatory. This locality was found to afford an insufficient exposure.

"A piece of ground was then rented and inclosed within the Old Deer Park. The experiments here showed that there was a considerable difference in the indications of anemometers of different sizes, but it was not possible to obtain a sufficient range of velocities to furnish a satisfactory comparison of the instruments. Experiments were finally made with a rotating apparatus, a steam merry-go-round, at the Crystal Palace, which led to some results similar to those obtained by exposure in the Deer Park.

"The subject has however been taken up so much more thoroughly by Doctors Dohrandt and Thiesen (*vide* "Repertorium für Meteorologie," vols. iv. and v.), and by Dr. Robinson in Dublin, that it seems unlikely that the balance would ever be expended by me. I therefore return it with many thanks to the Government Grant Committee.

"The results obtained by me were hardly of sufficient value to be communicated to the Society."

On examining the records it seemed to me that they were well deserving of publication, more especially as no other experiments of the same kind have, so far as I know, been executed on an anemometer of the Kew standard pattern. In 1860 Mr. Glaisher made experiments with an anemometer whirled round in the open air at the end of a long horizontal pole,[2] but the anemometer was of the pattern employed at the Royal Observatory, with hemispheres of 3·75 inches diameter and arms of 6·725 inches, measured from the axis to the centre of a cup, and so was considerably smaller than the Kew pattern. The experiments of Dr. Dohrandt and Dr. Robinson were made in a building, which has the advantage of sheltering the anemometer from wind, which is always more or less fitful, but the disadvantage of creating an eddying vorticose movement in the whole mass of air operated on; whereas in the ordinary employment of the anemometer the eddies it forms are carried away by the wind, and the same is the case to a very great extent when an anemometer is whirled in the open air in a gentle breeze. Thus, though Dr. Robinson employed among others an anemometer of the Kew pattern, his experiments and those of Mr. Jeffery are not duplicates of each other, even independently of the fact that the axis of the anemometer was vertical in Mr. Jeffery's and horizontal in Dr. Robinson's experiments; so that the greater completeness of the latter does not cause them to supersede the former.

In Mr. Jeffery's experiments the anemometers operated on were mounted a little beyond and above the outer edge of one of the steam merry-go-rounds in the grounds of the Crystal Palace, so as to be as far as practicable out of the way of any vortex which it might create. The distance of the axis of the anemometer from the axis of the "merry" being known, and the number of revolutions (n) of the latter during an experiment counted, the total space traversed by the anemometer was known. The number (N) of *apparent* revolutions of the anemometer, that is, the number of revolutions *relatively to the merry*, was recorded on a dial attached to the anemometer, which was read at the beginning and end of each experiment. As the machine would only go round one way the cups had to be taken off and replaced in a reverse position, in order to reverse the direction of revolution of the anemometer. The *true* number of revolutions of the anemometer was, of course, $N + n$, or $N - n$, according as the rotations of the anemometer and the machine were in the same or opposite directions.

The horizontal motion of the air over the whirling machine during any experiment was determined from observations of a dial anemometer with 3-inch cups on 8-inch arms, which was fixed on a wooden stand in the same horizontal plane as that in which the cups of the experimental instrument revolved, at a distance estimated at about 30 feet from the outside of the whirling frame. The motion of the centres of the cups was deduced from the readings of the dial of the fixed anemometer at the beginning and end of each experiment, the motion of the air being assumed as usual to be three times that of the cups.

The experiments were naturally made on fairly calm days, still the effect of the wind, though small, is not insensible. In default of further information, we must take its velocity as equal to the mean velocity during the experiment.

Let V be the velocity of the anemometer, W that of the wind, θ the angle between the direction of motion of the anemometer and that of the wind. Then the velocity of the anemometer relatively to the wind will be—

$$\sqrt{V^2 - 2VW\cos\theta + W^2} \quad . \quad . \quad . \quad . \quad . \quad (a)$$

The mean effect of the wind in a revolution of the merry will be different according as we suppose the moment of inertia of the anemometer very small or very great.

If, as is practically the case, W be small as compared with V, the correction to be added to V on account of the wind may be

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[1] "Discussion of the Results of some Experiments with Whirled Anemometers." Paper read at the Royal Society, May 12, by Prof. G. G. Stokes, Sec. R.S.

[2] "Greenwich Magnetical and Meteorological Observations," 1862, Introduction, p. li.

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